

## Executive Summary

The National Research Service Award (NRSA) predoctoral research training programs, sponsored by the National Institutes of Health (NIH), are designed to ensure an adequate supply of investigators in areas judged important to the Nation's health. Since their initiation in 1975, their major aim has been to identify and support the doctoral preparation of talented individuals who wish to pursue careers in biomedical and behavioral research. This is accomplished by awarding: (1) institutional training grants to institutions, which then select individuals and support their doctoral training; and (2) fellowships to individuals for supervised study with a senior scientist. Both types of awards are made on the basis of peer review. By FY 1997, the NRSA programs have evolved to the point where approximately 8,200 predoctoral trainees and fellows were receiving support.

To assess the extent to which the program has been achieving its goals, the NIH's Office of Research Training, in conjunction with the Committee on Research Training Assessment, compiled and analyzed available information on those who received at least nine months of NRSA predoctoral support and who completed their doctorate between 1981 and 1992. Characteristics of these individuals' training were examined and measures of their accomplishments in several areas were summarized. These included: (a) educational attainment; (b) postdoctoral training; (c) research-related employment; (d) success in applying for NIH and NSF research support; and (e) research productivity as defined by publication and citation rates. Their performance on these outcomes was then compared to two groups of doctorates who were graduate students during the same time period and who earned their degrees in the same disciplines as NRSA trainees and fellows. These two comparison groups differed in terms of where their training occurred. Members of the first comparison group (the NIH training institution group) graduated from departments that had NRSA predoctoral training grants, but unlike the NRSA trainees and fellows, they were not supported by these training grants. Comprising the second comparison group (the non-NIH training institution group) were Ph.D.s who earned their degrees from departments that were not awarded NRSA predoctoral training support.

The first comparison group was viewed as being the most similar to the NRSA recipients, given that individuals had met the same criteria for admission as the NRSA trainees and fellows and entered graduate school with similar research interests and backgrounds. They completed many of the same courses, interacted with the same faculty, and had access to resources that were available to all students in the program, regardless of how their graduate training was subsidized. These students also may have benefitted from NRSA training grants in terms of participating in activities that were developed with training grant funds. In contrast, members of the non-NIH training institution group were more likely to have been trained in environments that were more heterogeneous in student selection practices, training emphases, and degree requirements. In addition, their training experiences, particularly those associated with faculty research areas and institutional resources, were expected to differ from those of trainees and fellows who graduated from programs that actively sought and were successful in obtaining NIH training grants.

Four questions are addressed in this report. First, the extent to which NRSA participants pursued successful careers in biomedical and behavioral research -- the primary goal of the NRSA programs -- is examined. Second, their progress is then compared with their Ph.D. counterparts who were not awarded such support. Third, for those outcomes where groups differed, further analyses were performed to assess the contribution of NRSA predoctoral support in explaining these groups' differences, taking into account other factors that have been shown to affect career progress. Finally, the possibility that certain aspects of NRSA predoctoral support (e.g., timing and duration of support) were more likely to produce the intended outcomes was examined for outcomes closest to when NRSA predoctoral support ended.

## **Early Career Progress of NRSA Trainees and Fellows in the Biomedical Sciences**

In general, former NRSA predoctoral trainees and fellows in the biomedical sciences outperformed Ph.D.s in both comparison groups. Given that individuals who graduate from the same programs share many of the same training experiences regardless of how their graduate study was supported, this differential progress favoring NRSA predoctoral recipients was typically more pronounced in contrasts involving Ph.D.s from departments with no NRSA training grants. More specifically:

- (1) Former NRSA predoctoral trainees and fellows completed the doctorate in slightly less time, spending an average of 6.5 years in graduate school. This figure was 4-5 months shorter than individuals in either comparison group. Among NRSA trainees, those appointed to training grants during the first three years of doctoral study were significantly more likely to complete their degree in less time than trainees whose NRSA support began later (e.g., fourth year of graduate study).
- (2) The NRSA study group also was more likely to pursue postdoctoral training. An estimated 78 percent of trainees and fellows had completed or were in postdoctoral training appointments as of 1995 as compared to 60 percent of Ph.D.s from the same programs and 48 percent of those whose degree had been earned from departments without NIH training awards.
- (3) Seven to eight years after their degree, former trainees and fellows were more likely to hold a tenure-line faculty appointment (39 percent). This fraction was larger than those for either comparison group (29 and 32 percent for Ph.D.s from NIH and non-NIH training institutions, respectively). NRSA predoctoral training recipients also were more likely to be employed at institutions ranked in the top quartile of those with doctoral programs in the biomedical sciences.
- (4) Considering both academic and nonacademic positions, a higher percentage of NRSA study group members (87 percent) were in research career positions as compared to their fellow Ph.D.s from the same departments (77 percent) and from departments without NRSA training grant awards (72 percent).
- (5) By FY 1994, 46 percent of former trainees and fellows who earned their degrees between 1981 and 1988 had applied for one or more research grants from the NIH or the National Science Foundation (NSF). In contrast, 35 and 26 percent of Ph.D.s from the same departments or ones with no NIH training funds had submitted applications. Among applicants, the likelihood of receiving an award again was greater for those who had been supported by NRSA predoctoral training monies. Whereas two-thirds of the NRSA study group had successfully obtained at least one research grant by FY 1994, this was true for 55 and 47 percent of those from the NIH and non-NIH training institution groups.
- (5) Both the numbers of publications and citations to those publications were higher for NRSA predoctoral training recipients. To illustrate, former trainees and fellows who earned their degrees between 1981 and 1982 had published, on average, 13 publications by 1995; the means for Ph.D.s from the same departments and those without NRSA training grants were 9 and 10, respectively. Similar differences were found in average citation rates, which were 29 for former

trainees and fellows, 25 for those who graduated from the same doctoral programs, and 19 for Ph.D.s from departments with no NRSA training grant awards.

Regression analyses were conducted to examine the contribution of NRSA predoctoral support and other variables to explaining these differences in outcomes. The results indicated that while time-to-degree and the decision to pursue postdoctoral study partly stemmed from differences in Ph.D. field and other characteristics of graduate study, having a traineeship or fellowship also explained a small amount of the difference in performance between the NRSA study and comparison groups. For outcomes later in the career, other factors had more noticeable influences, such as having had postdoctoral training and obtaining a faculty position with regard to applying for research grants, obtaining research funds, and building strong publication records. Only in the case of NIH/NSF success rates did NRSA predoctoral support emerge as a contributor over and above these other variables.

### **Early Career Progress of NRSA Trainees and Fellows in the Behavioral Sciences**

Similar to the results for the biomedical sciences, there were differences in career progress between behavioral sciences Ph.D.s who had been supported by NRSA training grants and their comparison group counterparts, and these differences favored former trainees and fellows. Differences again were more noticeable in contrasts involving Ph.D.s from departments with no NRSA training grants. That is:

- (1) Although time-to-degree has been longer in the behavioral sciences, former NRSA predoctoral trainees and fellows completed their doctorate in slightly less time, taking an average 7.3 years as compared to 8.2 years for Ph.D.s from the same departments and 8.0 years for those from departments without NRSA training support. Those whose trainee appointments were made during the first three years of graduate school also were significantly more likely to complete their degree in less time than those whose appointments began later. This was also the situation with regard to how trainees viewed this support; those who rated it as the primary source of financial assistance for their doctoral studies earned their degree more quickly than those who did not view it as the most important contributor.
- (2) NRSA predoctoral trainees and fellows were considerably more likely to pursue postdoctoral study. Whereas 37 percent of those with NRSA predoctoral support went on to acquire additional postdoctoral training, this was the next step for only 26 and 19 percent of Ph.D.s from NIH and non-NIH training institutions.
- (3) As of 1995, 48 percent of former trainees and fellows were in tenure-track or tenured faculty positions. Corresponding figures were significantly smaller for their counterparts from departments without NRSA training support (34 percent) but more similar for Ph.D.s who graduated from the same programs as the NRSA group the same departments (40 percent). These appointments also were more likely to be in institutions with top-ranked behavioral science doctoral programs, particularly with regard to doctorates from programs with no NIH training funds; the percentages were 23, 14, and 10 percent for the NRSA, NIH, and non-NIH institution groups, respectively.
- (4) A greater percentage of former NRSA predoctoral trainees and fellows had applied for an NIH or NSF grant within six or more years following receipt of their degree. By FY 1994, 36 percent

of the NRSA study group had submitted an application as compared to 22 percent of their fellow graduate students from the same departments and 15 percent of those from departments with no NRSA training grant funds. Having applied, however, success rates did not differ markedly among the three groups, which were 49 percent for former trainees and fellows versus 45 and 42 percent for applicants from NIH and non-NIH training institutions.

- (5) There was some suggestion that Ph.D.s who had received NRSA predoctoral support remained more active publishers. Although sample sizes were too small to conduct meaningful comparisons on actual publication counts and citations, individuals' self-report revealed that the average number of 1990-95 publications was 5.5 for former trainees and fellows. This was significantly higher than the averages for Ph.D.s from the same departments (4.1) and ones that did not have NRSA training grants (3.1).

Regression analyses again were conducted to probe the factors underlying these observed differences. Overall, the results revealed that other variables were important in explaining these differences. Only for time-to-degree did NRSA predoctoral support play a significant (albeit very small) role in the shorter time spent in graduate school by former trainees and fellows in both comparison groups. It also was significant or approached significance in explaining the higher application rates of the NRSA study group. And although success rates did not appreciably differ, this greater tendency to apply for research grants may be indicative of greater interest in pursuing research in health-related areas. If true, this is not inconsequential, given that the majority of behavioral science researchers focus on other types of research areas and problems.

## **Conclusions and Implications**

In general, former NRSA predoctoral trainees and fellows in the biomedical and behavioral sciences outperformed Ph.D.s in both comparison groups on several measures of career progress. Despite the fact that the observed differences were often reasonably small, the consistent pattern of results favoring NRSA predoctoral awardees is noteworthy. It also supports the conclusion that Ph.D.s who have received NRSA traineeships and fellowships have been more likely to embark on careers in research as measured by their accomplishments during the early years following the degree.

At the same time, the evidence that their performance was a direct result of their NRSA predoctoral support is less strong. Once other variables known to affect career progress were taken into account, the contribution of NRSA support was reduced and often not statistically significant. Given the host of factors that affect careers and the complex interplay among them, however, it is encouraging to know that a small, residual effect was found in some outcomes. It also was the case that these variables as a whole only partially explained the differences between groups. This can be traced to several factors. For example, the measures available from existing data sets comprise a small set of ones that could be used for tracking careers, and may, in some instances, be pale surrogates of certain achievements (e.g., type of employment setting to measure involvement in a research career). For the behavioral sciences, in particular, the smaller pool of individuals supported by NRSA predoctoral training funds (as contrasted to the biomedical sciences) made the reliance on survey data more problematic; thus, sample estimates of performance for trainees and fellows in specific cohorts were often reasonably imprecise. Finally, NRSA predoctoral support itself could benefit from better measurement since trainees and fellows can have very different types of experiences in graduate school (e.g., research experience and mentoring). The same is true for individuals in the comparison groups, some of which could have had nearly identical experiences with trainees and fellows but been supported in other ways (e.g.,

prestigious university fellowships). Consequently, some of these problems (e.g., insensitive measures) may have led to the inability to detect group differences where they existed.

Nevertheless, the data presented on the progress of former NRSA trainees and fellows through their doctoral training and early career parallels the findings of previous evaluations, indicating that the programs and individuals selected by the NIH peer review system have continued to produce individuals who go on to actively pursue research careers. Although the relative effects of NRSA predoctoral support could not be confidently identified, the results are useful in judging the performance of NRSA recipients themselves, taking factors known to influence career paths such as degree field, reputation of the doctorate-granting institution, and additional postdoctoral training into account. In addition, the examination of time-to-degree differences among the NRSA trainees sheds some light on how traineeships in general may facilitate graduate education over other support alternatives. Hopefully, the study results can be useful in informing future discussions on graduate education and whether the training grant can serve as a model for doctoral training,